

THE PREMIUM COAL SAMPLE PROGRAM AT THE ARGONNE NATIONAL LABORATORY

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PURPOSE OF THE PREMIUM COAL SAMPLE PROGRAM

The purpose of the Premium Coal Sample Program is to provide the coal science research community with long term supplies of a small number of premium coal samples that can be used as standards for comparison. The premium coal samples produced from each coal and distributed through this program will be as chemically and physically identical as possible, have well characterized chemical and physical properties, and will be stable over long periods of time. Coals will be mined, transported, processed into the desired particle and sample sizes, and packaged into environments as free of oxygen as possible. Humidity will also be controlled to keep the coals as pristine and in as stable of a condition as possible.

The need for a Premium Coal Sample Program was expressed at the Coal Sample Bank Workshop held March 27 and 28, 1981 in Atlanta, Georgia.

WHAT A PREMIUM SAMPLE IS

A premium coal sample has been specially selected, processed and stored to keep it as close to its original condition as possible. Specifically:

- Contact with oxygen has been minimized at all stages from mining, transport and processing in a nitrogen filled facility to sealing in amber colored glass vials.
- Relative humidity and temperature are controlled in the processing facility to maintain the equilibrium moisture of the original coal.
- Uniformity of samples is achieved by processing about 750 kg of coal in a single batch, mixing thoroughly in a special blender, and finishing with a spinning riffler to assure well-mixed samples. Activation analyses have confirmed the thoroughness of the mixing.
- Stability of the samples is maximized by sealing in amber-colored glass with a fuel-rich hydrogen-oxygen flame.
- Secure, long-term supplies result from an initial production of 10,000 five gram ampoules and 5,000 twenty gram ampoules with 50 five gallon sealed glass carboys in reserve for future ampoule production from each metric ton sample of coal.
- Some special needs can be met from lumps stored in argon in two reserve 55 gallon drums, and one 15 gallon drum as part of the original sample. A separate nitrogen filled glove box will be used for processing these requests.

SELECTION, MINING, AND TRANSPORT

Initially the coals have been selected to cover a wide range of degrees of coalification, mineral content, and sulfur content as well as commercial significance. The first three will be low-, medium- and high-volatile bituminous coals. The next two are planned to be lignite and sub-bituminous coals. These samples will be channel samples, representing a uniform cross section of the seam from top to bottom. Mining, under the supervision of coal geologists, involves removal of large lumps from a freshly exposed face to special plastic containers, transfer to stainless steel drums at the surface, purging with argon, transfer to refrigerated truck and immediate transport to the processing facility. A careful description of the geology of the sample area and location will be prepared and available as a referencable document.

SAMPLE PROCESSING

At the processing facility, a sample of argon from the coal drum will be analyzed to establish the relative humidity for the nitrogen filled processing facility. The stainless steel drums will be loaded into an airlock, which is then purged with nitrogen. The drums will be emptied into a crusher to reduce the size to 1/4", then pulverized in a cooled impact mill to obtain -20 mesh material. Coarse material will be recycled. The pulverized material will be collected in a nitrogen filled mixer-blender selected for gentle but thorough mixing. After thorough mixing the pulverized coal will be conveyed to a spinning riffler and sealed in 20 gram ampoules and 5 gallon glass carboys. The contents of some of the carboys will then be recycled to the pulverizer and crushed to pass a 100 mesh screen. After thorough blending this material will be conveyed to the packaging unit for sealing in 5 gram amber colored ampoules and 5 gallon borosilicate glass carboys. One of the goals of the Program is to complete the processing within seven days of exposing the mine face. Figure 1 indicates the coal storage system for a metric ton sample. Figure 2 is a block diagram of the coal sample preparation.

CHARACTERIZATION

The coals will be characterized by chemical and physical analysis. Results will be available for each coal in the form of a printed sample announcement. Requests to be placed on a mailing list should be sent to the author. The requestor should include mailing address, telephone number and research interests.

The analyses will include proximate, ultimate, calorific values, sulfur forms, equilibrium moisture, oxygen by neutron activation analysis, maceral analysis, Gieseler plasticity for the bituminous coals, and mineral matter major elements among others. Multiple laboratories will be involved in the analyses. Round robin analyses are also being organized.

A variety of stability monitoring tests will be used including evolved gas analysis. In addition the bituminous samples will be monitored by repetitive Gieseler plasticity analyses.

AVAILABILITY

Initial samples are expected to be available in fall, 1984. Samples will be made available to research personnel at a nominal replacement cost. A special glove box filled with nitrogen is available to transfer contents of ampoules to special sample holders on request. Also, a very limited quantity of lump coal, stored under similar inert conditions will be available on special request for special physical property measurements. The processing facility can be made available for occasional processing of special samples.

INFORMATION ON SAMPLES

Each recipient of samples is asked to provide either a literature reference to papers in widely circulated journals, or a copy of less widely circulated reports and papers, to be shared with other users of the samples. Listings of these references will be available on request to the author (phone 312-972-7374) either in printed versions or via computer terminal. The Premium Coal Sample Program expects to work with other coal sample programs in providing samples and sharing information.

Following the reports from the use of a number of samples, workshops are planned to facilitate sharing research results and to foster basic understanding of the chemistry and physical properties of the coal.

USERS ADVISORY COMMITTEE

A Users Advisory Committee provides useful suggestions to the Program Manager. This group includes: Dr. Blaine Cecil, U. S. Geological Survey; Dr. Marvin Poutsma, Oak Ridge National Laboratory; Dr. Ronald Pugmire, University of Utah; Dr. William Spackman, Pennsylvania State University; Dr. Irving Wender, University of Pittsburgh; Dr. Randall Winans, Argonne National Laboratory; Dr. John Young, Argonne National Laboratory.

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Figure 1. Coal storage system.

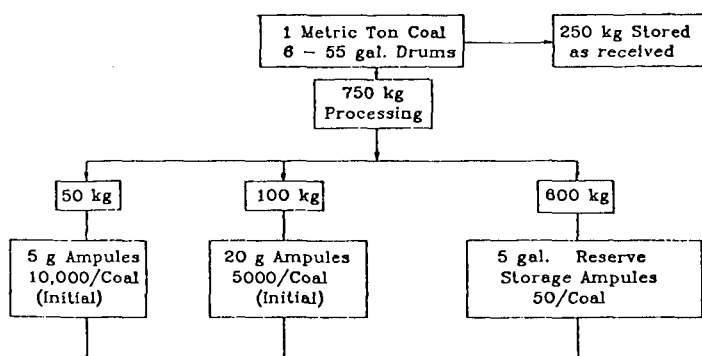


Figure 2. Coal Sample Preparation - Block Diagram

